WHAT IS CLAIMED IS:

1. A pulse modulator for a nonradiative dielectric waveguide, comprising:

parallel plate conductors one separated from the other by a distance not greater than one half wavelength of a high frequency signal;

a circulator placed between the parallel plate conductors, the circulator including two ferrite plates disposed opposite each other on inner surfaces of the parallel plate conductors, a plurality of mode suppressors, each constructed from a dielectric waveguide for transmitting therethrough an LSM mode electromagnetic wave while shutting off an LSE mode electromagnetic wave, and arranged in such a manner as to extend substantially radially from the two ferrite plates, and an impedance matching member mounted on one end face of each of the mode suppressors and having a dielectric constant different from that of the dielectric waveguide; and

a pulse modulation switch constructed from a Schottky barrier diode connected at an intermediate point along a choke-type bias supply line formed on a dielectric wiring substrate, the pulse modulation switch being mounted on the other end face of any one of the mode suppressors in such a manner that a direction of application of a bias voltage to the Schottky barrier diode coincides with a direction of electric field of the LSM mode electromagnetic wave,

wherein a distance from an edge of each of the ferrite plates to the Schottky barrier diode is set approximately equal to $n\lambda/2$ where n is an integer not smaller than 1, and λ is the wavelength of the high frequency signal.

2. The pulse modulator of claim 1, wherein an intermediate dielectric waveguide having substantially the same width as that of the mode suppressor is placed between the mode suppressor and the pulse modulation switch.

3. The pulse modulator of claim 1, wherein the dielectric waveguide and the impedance matching member have a relation defined by $-10 \leqq (\varepsilon r2 - \varepsilon r1) \leqq 20$ $(\varepsilon r1 \neq \varepsilon r2)$, where $\varepsilon r1$ is the dielectric constant of the dielectric waveguide and $\varepsilon r2$ is the dielectric constant of the impedance matching member.

4. The pulse modulator of claim 1, wherein a thickness of the impedance matching member, measured along the direction of transmission of the high frequency signal, is 0.05 mm to 0.5 mm.

5. The pulse modulator of claim 1, wherein the impedance matching member is formed of at least one selected from the group consisting of alumina ceramics, forsterite ceramics, spinel ceramics, mullite ceramics, and silicon nitride ceramics.

6. A millimeter wave transmitter/receiver, wherein, between parallel plate conductors one separated from the other by a distance not greater than one half wavelength of a millimeter wave signal to be transmitted, there are provided:

a first dielectric waveguide for propagating the millimeter wave signal therethrough;

a millimeter wave signal oscillator, attached to the first dielectric waveguide, for generating the millimeter wave signal using a high frequency generating device, and for propagating the millimeter wave signal into the first dielectric waveguide;

a second dielectric waveguide whose one end is electromagnetically coupled by proximity to the first dielectric waveguide, or is joined to the first dielectric waveguide, thereby propagating a portion of the millimeter wave signal into a mixer;

a circulator having a first connection part, a second connection part, and a third connection part provided as input/output ends for the millimeter wave signal and arranged at prescribed intervals around ferrite plates mounted parallel to the parallel plate conductors, the circulator having a function of directing the millimeter wave signal inputted through one of the connection parts, into another one of the connection parts that is adjacent in clockwise or counterclockwise direction in a plane of the ferrite plates, wherein the first connection

part is connected to the output end of the first dielectric waveguide at which the millimeter wave signal is outputted;

a third dielectric waveguide, connected to the second connection part of the circulator, for propagating the millimeter wave signal therethrough, the third dielectric waveguide having a transmitting/receiving antenna at an end portion thereof;

a fourth dielectric waveguide for propagating into the mixer a received wave received by the transmitting/receiving antenna, propagated through the third dielectric waveguide, and outputted through the third connection part of the circulator; and

a mixer section for generating an intermediate frequency signal by mixing a portion of the millimeter wave signal with the received wave, the mixer section being constructed by electromagnetically coupling an intermediate portion of the second dielectric waveguide by proximity to an intermediate portion of the fourth dielectric waveguide or by joining the second and fourth dielectric waveguides together,

wherein the pulse modulator of claim 1 is placed between the circulator and a signal coupling portion of the first dielectric waveguide from which the portion of the millimeter wave signal is coupled into the second dielectric waveguide.

7. A millimeter wave transmitter/receiver, comprising:

a pair of parallel plate conductors one separated from

the other by a distance not greater than one half wavelength of a millimeter wave signal to be transmitted;

a first dielectric waveguide for propagating the millimeter wave signal therethrough;

a millimeter wave signal oscillator, attached to the first dielectric waveguide, for generating the millimeter wave signal using a high frequency generating device, and for propagating the millimeter wave signal into the first dielectric waveguide;

a second dielectric waveguide whose one end is electromagnetically coupled by proximity to the first dielectric waveguide, or is joined to the first dielectric waveguide, thereby propagating a portion of the millimeter wave signal into a mixer;

a pulse modulator for a nonradiative dielectric waveguide, including:

a first circulator constructed with two ferrite plates disposed opposite each other on inner surfaces of the parallel plate conductors, a plurality of mode suppressors, each constructed from a dielectric waveguide for transmitting therethrough an LSM mode electromagnetic wave while shutting off an LSE mode electromagnetic wave, and arranged in such a manner as to extend substantially radially from the two ferrite plates, and an impedance matching member mounted on one end face of each of the mode suppressors and having a dielectric constant different from that of the dielectric waveguide, the

first circulator having a function of directing the millimeter wave signal inputted from one of the mode suppressors, into another one of the mode suppressors that is adjacent in clockwise or counterclockwise direction in a plane of the ferrite plates, and

a pulse modulation switch comprising a dielectric wiring substrate, a choke-type bias supply line formed on the dielectric wiring substrate, and a Schottky barrier diode connected to an intermediate point of the choke-type bias supply line,

wherein the first dielectric waveguide is connected to a first mode suppressor of the plurality of mode suppressors of the first circulator at a position on the downstream side, as viewed in signal propagation direction, of a signal coupling portion where the portion of the millimeter wave signal is coupled into the second dielectric waveguide, and

the pulse modulation switch is mounted on the farthest end face of a second mode suppressor of the plurality of mode suppressors of the first circulator in such a manner that a direction of application of a bias voltage to the Schottky barrier diode coincides with a direction of electric field of the LSM mode electromagnetic wave, and that the distance from an edge of the ferrite plates to the Schottky barrier diode is approximately equal to $n\lambda/2$ where n is an integer not smaller than 1, and λ is the wavelength of the high frequency signal;

a second circulator constructed with two ferrite plates disposed opposite each other on the inner surfaces of the parallel plate conductors, a plurality of mode suppressors, each constructed from a dielectric waveguide for transmitting therethrough an LSM mode electromagnetic wave while shutting off an LSE mode electromagnetic wave, and arranged in such a manner as to extend substantially radially from the two ferrite plates, and an impedance matching member mounted on one end face of each of the mode suppressors and having a dielectric constant different from the dielectric constant of the dielectric waveguide, the second circulator having a function of directing the millimeter wave signal inputted from one of the mode suppressors, into another one of the mode suppressors that is adjacent in clockwise or counterclockwise direction in the plane of the ferrite plates, wherein one of the plurality of mode suppressors of the second circulator is a third mode suppressor of the plurality of mode suppressors of the first circulator;

a transmitting/receiving antenna, connected to a fourth mode suppressor of the plurality of mode suppressor of the second circulator, for propagating the millimeter wave signal therethrough for transmission or reception of the millimeter wave signal, the fourth mode suppressor being another one of the plurality of mode suppressors of the second circulator;

a third dielectric waveguide for propagating into the

mixer a received wave received by the transmitting/receiving antenna, propagated through the fourth dielectric waveguide, and outputted from a fifth mode suppressor of the plurality of mode suppressor of the second circulator, the fifth mode suppressor being another one of the plurality of mode suppressors in the second circulator; and

a mixer section for generating an intermediate frequency signal by mixing the portion of the millimeter wave signal with the received wave, the mixer section being constructed by electromagnetically coupling an intermediate portion of the second dielectric waveguide by proximity to an intermediate portion of the third dielectric waveguide or by joining the second and third dielectric waveguides together,

wherein the first dielectric waveguide, the millimeter wave signal oscillator, the second dielectric waveguide, the pulse modulator, the second circulator, the third dielectric waveguide, and the mixer section are arranged between the parallel plate conductors.

8. The millimeter wave transmitter/receiver of claim 7, wherein in the pulse modulator, an intermediate dielectric waveguide having substantially the same width as that of the mode suppressor is placed between the mode suppressor and the pulse modulation switch.

9. The millimeter wave transmitter/receiver of claim 7, wherein in the pulse modulator, the dielectric waveguide and the impedance matching member have a relation defined by $-10 \leqq (\varepsilon r2 - \varepsilon r1) \leqq 20$ $(\varepsilon r1 \neq \varepsilon r2)$, where $\varepsilon r1$ is the dielectric constant of the dielectric waveguide and $\varepsilon r2$ is the dielectric constant of the impedance matching member.

10. The millimeter wave transmitter/receiver of claim 7, wherein in the pulse modulator, a thickness of the impedance matching member, measured along a direction of transmission of the high frequency signal, is 0.05 mm to 0.5 mm.

11. The millimeter wave transmitter/receiver of claim 7, wherein in the pulse modulator, the impedance matching member is formed of at least one selected from the group consisting of alumina ceramics, forsterite ceramics, spinel ceramics, mullite ceramics, and silicon nitride ceramics.

12. A millimeter wave transmitter/receiver, wherein, between parallel plate conductors one separated from the other by a distance not greater than one half wavelength of a millimeter wave signal to be transmitted, there are provided:

a first dielectric waveguide for propagating the millimeter wave signal therethrough;

a millimeter wave signal oscillator, attached to the first

dielectric waveguide, for generating the millimeter wave signal using a high frequency generating device, and for propagating the millimeter wave signal into the first dielectric waveguide;

a second dielectric waveguide whose one end is electromagnetically coupled by proximity to the first dielectric waveguide, or is joined to the first dielectric waveguide, thereby propagating a portion of the millimeter wave signal into a mixer;

a circulator having a first connection part, a second connection part, and a third connection part provided as input/output ends for the millimeter wave signal and arranged at prescribed intervals around ferrite plates mounted parallel to the parallel plate conductors, the circulator having a function of directing the millimeter wave signal inputted through one of the connection parts, into another one of the connection parts that is adjacent in clockwise or counterclockwise direction in a plane of the ferrite plates, wherein the first connection part is connected to the output end of the first dielectric waveguide at which the millimeter wave signal is outputted;

a third dielectric waveguide, connected to the second connection part of the circulator, for propagating the millimeter wave signal therethrough, the third dielectric waveguide having a transmitting antenna at an end portion thereof;

a fourth dielectric waveguide having a receiving antenna at an end portion thereof and the mixer at the other end; and

a mixer section for generating an intermediate frequency signal by mixing the portion of the millimeter wave signal with the received wave, the mixer section being constructed by electromagnetically coupling an intermediate portion of the second dielectric waveguide by proximity to an intermediate portion of the fourth dielectric waveguide or by joining the second and fourth dielectric waveguides together,

wherein the pulse modulator of claim 1 is placed between the circulator and a signal coupling portion of the first dielectric waveguide from which the portion of the millimeter wave signal is coupled into the second dielectric waveguide.

13. A millimeter wave transmitter/receiver, comprising:

a pair of parallel plate conductors one separated from the other by a distance not greater than one half wavelength of a millimeter wave signal to be transmitted;

a first dielectric waveguide for propagating the millimeter wave signal therethrough;

a millimeter wave signal oscillator, attached to the first dielectric waveguide, for generating the millimeter wave signal using a high frequency generating device, and for propagating the millimeter wave signal into the first dielectric waveguide;

a second dielectric waveguide whose one end is electromagnetically coupled by proximity to the first dielectric waveguide, or is joined to the first dielectric waveguide,

thereby propagating a portion of the millimeter wave signal into a mixer;

a pulse modulator for a nonradiative dielectric waveguide, including:

a circulator constructed with two ferrite plates disposed opposite each other on inner surfaces of the parallel plate conductors, a plurality of mode suppressors, each constructed from a dielectric waveguide for transmitting therethrough an LSM mode electromagnetic wave while shutting off an LSE mode electromagnetic wave, and arranged in such a manner as to extend substantially radially from the two ferrite plates, and an impedance matching member mounted on one end face of each of the mode suppressors and having a dielectric constant different from that of the dielectric waveguide, the circulator having a function of directing the millimeter wave signal inputted from one of the mode suppressors, into another one of the mode suppressors that is adjacent in clockwise or counterclockwise direction in a plane of the ferrite plates, and

a pulse modulation switch comprising a dielectric wiring substrate, a choke-type bias supply line formed on the dielectric wiring substrate, and a Schottky barrier diode connected to an intermediate point of the choke-type bias supply line,

wherein the first dielectric waveguide is connected to a first mode suppressor of the plurality of mode suppressors of the circulator at a position on the downstream side, as

viewed in signal propagation direction, of a signal coupling portion where the portion of the millimeter wave signal is coupled into the second dielectric waveguide, and

the pulse modulation switch is mounted on the farthest end face of a second mode suppressor of the plurality of mode suppressors of the circulator in such a manner that a direction of application of a bias voltage to the Schottky barrier diode coincides with a direction of electric field of the LSM mode electromagnetic wave, and that the distance from an edge of the ferrite plates to the Schottky barrier diode is approximately equal to $n\lambda/2$ where n is an integer not smaller than 1, and λ is the wavelength of the high frequency signal;

a transmitting antenna, connected to a third mode suppressor of the plurality of mode suppressors of the circulator, for propagating the millimeter wave signal therethrough for transmission of the millimeter wave signal;

a third dielectric waveguide having a receiving antenna at an end portion thereof and the mixer at the other end; and

a mixer section for generating an intermediate frequency signal by mixing the portion of the millimeter wave signal with the received wave, the mixer section being constructed by electromagnetically coupling an intermediate portion of the second dielectric waveguide by proximity to an intermediate portion of the third dielectric waveguide or by joining the second and third dielectric waveguides together,

wherein the first dielectric waveguide, the millimeter wave signal oscillator, the second dielectric waveguide, the pulse modulator, the third dielectric waveguide, and the mixer section are arranged between the parallel plate conductors.

14. The millimeter wave transmitter/receiver of claim 13, wherein in the pulse modulator, an intermediate dielectric waveguide having substantially the same width as that of the mode suppressor is placed between the mode suppressor and the pulse modulation switch.

15. The millimeter wave transmitter/receiver of claim 13, wherein in the pulse modulator, the dielectric waveguide and the impedance matching member have a relation defined by $-10 \leqq (\varepsilon r2 - \varepsilon r1) \leqq 20$ ($\varepsilon r1 \neq \varepsilon r2$), where $\varepsilon r1$ is the dielectric constant of the dielectric waveguide and $\varepsilon r2$ is the dielectric constant of the impedance matching member.

16. The millimeter wave transmitter/receiver of claim 13, wherein in the pulse modulator, the thickness of the impedance matching member, measured along a direction of transmission of the high frequency signal, is 0.05 mm to 0.5 mm.

17. The millimeter wave transmitter/receiver of claim 13, wherein in the pulse modulator, the impedance matching member

is formed of at least one selected from the group consisting of alumina ceramics, forsterite ceramics, spinel ceramics, mullite ceramics, and silicon nitride ceramics.